

burg, on May 17, and was observed by Messier and Maraldi at Paris until July 2. When first seen it was just visible to the naked eye. The interval between the perihelion passages is 114.91 years, and with such period of revolution, with the other elements of 1762, the descending node would fall about 0.27 from the orbit of Mars and the ascending node at a radius-vector of 3.35, or in the region occupied by the minor planets; thus the difference of inclination will not be easily explained on the supposition of identity of the comets, though it must be remarked that elements of the present comet founded upon the first few days' observations may be open to more sensible correction than is usually the case.

"THE OBSERVATORY, A MONTHLY REVIEW OF ASTRONOMY."—There is ample room for the new astronomical periodical, which has been launched by Mr. Christie, the First Assistant of the Royal Observatory, Greenwich, under the above title, during the last week. Its aim is to present in a popular form a general survey of the progress of astronomy and to afford early intimation of recent advances. Such a publication ought to be well supported in this country, where astronomical amateurs are in great force. The first number holds out good augury for the future; amongst the contents are a report of the proceedings at the last meeting of the Royal Astronomical Society, proceedings which are not detailed in the *Monthly Notices*, where the discussions following the reading of papers are, as a rule, ignored, but which, as everyone knows who has been in the habit of attending the meetings of our scientific societies, are frequently the most interesting feature in the evening's proceedings; and we hope this point will not be lost sight of in the new periodical. There is an article on the photographic spectra of stars, a subject known to have lately much occupied the attention of the president, by whom it is furnished; the first part of a contribution from Mr. Gill, on the determination of the solar parallax; remarks on the nebular hypothesis, by Mr. Darwin, being an account of an inquiry intended to suggest a cause which may fill up a hiatus in the theory, and an outline of the results of Dr. von Asten's [researches on the motion of Encke's Comet, recently communicated to the St. Petersburg Academy; also, ephemerides for physical observations of the moon and of Jupiter, by Mr. Marth, whose assistance in this direction deserves the high appreciation of observers. We will further express the hope that accuracy of typography may characterise the future numbers of Mr. Christie's publication; it is most important that this should be the case if the confidence of the practical astronomer is to be secured for it, and we are induced to offer this suggestion from remarking one or two inaccuracies in the first number, as on p. 4, where the search for an intra-mercurial planet by the Rev. S. J. Perry is dated in April instead of in March, and on p. 27, where Mr. Swift's discovery of the comet subsequently found by M. Borrelly, is erroneously referred to April 5, which was the date of discovery of the previous comet.

THE NEBULÆ—WHAT ARE THEY?¹

BEFORE the announcement of Mr. Huggins's discovery of the presence of bright lines in the spectra of nebulae, it was generally, if not universally, accepted as a fact that nebulae were merely stellar clusters irresolvable on account of their great distances from us. This view had become impressed on the minds of many of our greatest observing astronomers in the progress of their work, and is one therefore which should not lightly be abandoned.

It appears to me that Mr. Huggins's observations instead of being inconsistent with the view formerly held by astronomers, are rather confirmatory of the correctness of that view.

¹ On a Cause for the Appearance of Bright Lines in the Spectra of Irresolvable Star Clusters. Paper read at the Royal Society by E. J. Stone, M.A., F.R.S., Her Majesty's Astronomer, Cape of Good Hope.

The sun is known to be surrounded by a gaseous envelope of very considerable extent. Similar envelopes must surround the stars generally. Conceive a close stellar cluster. Each star, if isolated, would be surrounded by its own gaseous envelope. These gaseous envelopes might, in the case of a cluster, form over the whole, or a part of the cluster, a continuous mass of gas. So long as such a cluster was within a certain distance from us the light from the stellar masses would predominate over that of the gaseous envelopes. The spectrum would therefore be an ordinary stellar spectrum. Suppose such a cluster to be removed further and further from us, the light from each star would be diminished in the proportion of the inverse square of the distance; but such would not be the case with the light from the enveloping surface formed by the gaseous envelopes. The light from this envelope received on a slit in the focus of an object-glass would be sensibly constant because the contributing area would be increased in the same proportion that the light received from each part is diminished. The result would be that at some definite distance, and all greater distances, the preponderating light received from such a cluster would be derived from the gaseous envelopes and not from the isolated stellar masses. The spectrum of the cluster would therefore become a linear one, like that from the gaseous surroundings of our own sun. The linear spectrum might, of course, under certain circumstances, be seen mixed up with a feeble continuous spectrum from the light of the stars themselves.

It should be noticed that, in this view of the subject, the linear spectrum can only appear when the resolvability of the cluster is at least injuriously affected by the light of the gaseous envelopes, becoming sensibly proportional to that from the stellar masses, and that in the great majority of such cases it would only be in the light from the irresolvable portions of the cluster that bright lines could be seen in the spectrum.

The changes in form which would be presented to us by such a nebula might be expected to be small. These changes would depend chiefly upon changes in the distribution of the stellar masses constituting the cluster. It has always appeared to me difficult to realise the conditions under which isolated irregular masses of gas, presenting to us sharp angular points, could exist uncontrolled by any central gravitational mass without showing larger changes in form than appear to have been the case with many of the nebulae. In my view of the nature of nebulae this difficulty no longer exists.

THE RACES AND TRIBES OF THE CHAD BASIN

ON this subject a most valuable paper has been contributed to the last number of the *Zeitschrift der Gesellschaft für Erdkunde* by Dr. G. Nachtigal, one of the few living writers entitled to speak with authority on the ethnography of Sudan. While the great problems now being rapidly solved in the portion of Africa lying south of the equator are almost exclusively of a strictly geographical nature, those still awaiting solution in the northern half of the Continent are on the contrary mainly of an ethnological character. The reason of this pointed difference is very obvious. Although there are vast regions south of the line still unexplored, enough is already known to warrant the conclusion that what remains to be there discovered is peopled by the same great race holding almost exclusive possession of the parts already opened up by the spirit of modern enterprise. With the sole exception of the extreme south-western corner, occupied by the Namaqua and Cape Hottentots, and of some districts also in the south still haunted by a few straggling Bushman tribes, the whole of Africa from the equator southwards would seem to be the domain of what is now conventionally known to philologists as the Bantu

family. Whatever be their origin, all the countless tribes here settled are now at least linguistically united into one group, all of them, with the exceptions already specified, apparently speaking dialects of some one common mother tongue now extinct. Hence however interesting the questions that still remain to be settled relating to the physical geography of Africa south of the equator, its ethnography, so far as that can be determined by the test of language, presents little or no further difficulty.

But north of the equator the case is completely reversed. Here there doubtless remain to be cleared up some few geographical points, such, for instance, as the water parting of the White Nile and Lake Chad, the course of the Upper Shari, and especially that of the Ogoway, so far as it may flow north of the line. But on the whole the main physical features of this half of the continent may be said to be at last fairly settled.

Its ethnology, on the contrary, only becomes all the more complicated in proportion as our knowledge of the land and its peoples increases.¹ No doubt we have here also one or two widespread linguistic groups, such as the Semitic, represented by two of its branches—the Arabic in the Barbary States and Egypt, and the Himyaritic (Lesana Gêz, Tigré, and Amharic) in Abyssinia. There is also the great Hamitic family, with its three distinct branches—Egyptian, Libyan, and Ethiopic—occupying more than one half of the Sahara, from about the 15° E. long. to the Atlantic seaboard, large tracts in the south of the Barbary States, parts of Egypt and Nubia, and the whole of the Galla country and Somaliland as far south as the River Dana or Pocomo, where it is met by the Waswahili and other Bantu tribes of the eastern seaboard.

But there still remains the pure negro race, properly so-called, occupying nearly the whole of the Sudan in its widest sense, the banks of the White Nile, and all its head streams, from Khartum to the Victoria Nile, and in all probability the still unexplored regions of the Ogoway, and of Central equatorial Africa generally, from Cape Lopez inland, to the Blue Mountains west of the Albert Nyanza, and from Lake Chad southwards to the equator. Here we find innumerable negro tribes, dwelling more especially in three great centres of population—the region between the Niger and the West Coast, the Basin of the Chad, and the Upper Nile, with all its head streams²—tribes generally speaking differing as much in speech as they would seem on the whole to resemble each other in their main physical features. Here live the Wolofs, the Veis, the numerous Mandenga and Haussa peoples, the Fulahs (who, however, are not Negroes), the Masa family, the Bagirmi, Babir, Nyamnyam, Shilluk, and many other Niger, Gambia, Chad, and Nilotic races, all speaking idioms seemingly in no way related to each other, and in fact possessing nothing in common with any known forms of speech beyond the general and somewhat vague feature of agglutination characteristic of most, if not of all, of them. Here, therefore, we have many linguistic and ethnological puzzles still awaiting solution, and forming, as stated, the counterpart of the topographical mysteries now being so successfully unveiled in the southern half of the continent.

The Basin of Lake Chad, situated in the very heart of this vast region, is peopled by such a bewildering number

of races, as to have hitherto baffled all attempts at analysis, or any general classification based on recognised scientific principles. Here we find dwelling either separately or together, branches of the Semite, Hamite, Fulah, and Haussa races, though none of them, except the Semite Arabs, in any considerable numbers. Here is further represented every variety of the mysterious Tibu people, who elsewhere share the Great Desert with the Twareg (Tuareg) Berbers—Teda and Dasa, that is, northern and southern Tibus, Tibus pure and mixed, nomad and settled. Here also are the Kanembu,³ or people of Kanem, who are Tibus one degree removed, and the Kanuri or Magomj, the ruling race in Bornu, who may be described as Tibus, or rather Kanembu, in the third and fourth degree, in other words, half-caste descendants of Kanembu and the Aboriginal Negro inhabitants of the land. Here are, moreover, the Margi, Mandara, Makari, Logon, and other members of the Masa or Mosgu family, in all probability akin to, if not the collateral descendants of, the So or Sou people, now either extinct or absorbed in the Tara, Manga, Ngalmaduko, Dalatoa, and other Kanuri tribes. Here, too, are the Bede, Babir, and some other independent or unclassified Negro peoples, fragments of the Kuka and Bulala from Lake Fitri, and lastly, the Bagirmi from the neighbourhood of the Middle Shari, and apparently connected with the Jur and Dor tribes on the western head waters of the White Nile, thus forming a sort of connecting link between the Nilotic Negro tribes, and those of Central Sudan.

All or most of these data were doubtless previously known, at least in a vague or general way; but thanks to Dr. Nachtigal's careful investigations on the spot, we are now for the first time enabled to form a clear idea of the various geographical, political, social, and linguistic relations of these different peoples, one to the other. Unfortunately in his elaborate monograph he treats the whole subject under the threefold division of races in Kanem, Bornu, and the lake islands, a political rather than an ethnographic distribution, which is all the more confusing that several Kanembu tribes, such as the Sugurti and Tomagheri, are now settled also in Bornu, while on the other hand several Bornu or Kanuri people, such as the Magomi of Fuli on the east coast, the Bulua, Malemia, and Ngalma Dukko, have found their way back to Kanem, whence their forefathers originally migrated westwards.

The inconvenience, however, arising out of this arrangement of the subject matter is largely obviated by the excellent coloured map accompanying the paper, without which it would in fact be scarcely intelligible to the ordinary reader. It will therefore be necessary in the subjoined *résumé* of Nachtigal's conclusions to depart somewhat from his triple division, and give a general classification of all the Chad races, based rather on their permanent linguistic and physical affinities than on their accidental political relations, while in all other respects closely adhering to the data supplied by him.

The map above referred to is shaded in ten different colours, corresponding to so many distinct peoples. But one of these colours comprises four not yet classified Negro tribes on the west and south-west frontier of Bornu, between that state and the adjoining Haussa states further west. On the other hand, the Bagirmi are not represented at all by any of these colours, so that four more shades would really be needed to embrace all the Chad races, while even then excluding such more remote peoples as the Adamawa on the south-west and the Fulahs on the west.

It thus appears that all the peoples dwelling either round about the Chad or on its numerous islands may be grouped under the subjoined fourteen main divisions:—(1) Tibus (Teda, Dasa, and Kojam); (2) Kanembu;

¹ A striking proof of this is afforded by the recent expedition of Dr. W. Junker along the Lower Sobat from its junction with the White Nile to Nasser, the most advanced Egyptian military station in that direction. He informs us that between these two points are spoken no less than five distinct idioms, some of which are now heard of for the first time. These would seem to be the Nuer, along the right bank of the Sobat, and the Shilluk, Janghey, Fallangh, and Nuiak on the left. And beyond Nasser he reports the existence of many other independent tribes on the Middle and Upper Sobat, such as the Bonjak, Jibbe, Kunkung, Nikuar, and Chai, all apparently speaking different languages.

² Reporting last year to the Egyptian Government on the White Nile between Duffli and Magungo, Gen. Gordon Pasha remarks: "Le pays est très peuplé; beaucoup plus qu'aucune autre partie de l'Afrique."

³ The suffix *bu* is simply the plural of the personal suffix *na*: *Kanembu* = a native of Kanem; *Kanembu* = the people of Kanem.

(3) Kanuri or Magomi; (4) Masa or Mosgu; (5) Yedina or Buduma and Kuri; (6) Bulala and Kuka; (7) Dana or Danawa; (8) Bede; (9) Ngisem; (10) Kerrikerri; (11) Babir; (12) Bagirmi; (13) Hausa; (14) Arabs.

1. TIBUS, of whom, as already stated, every variety is represented. They occupy the greater part of Kanem proper and are found on both banks of the Komodugu Yoohe in Bornu, between the 12° and 13° E. long. Principal pure nomad Tibu tribes: Gunda, Atereta, Worda, Juroa, or Osumma, Mada, Wandala, Dogorda, with a total population of 13,000. Principal pure settled Tibu tribes: Salemea, Beggaroa, Aborda, Nawarma, Oreddo, and Billea, numbering altogether 4,400. Mixed and doubtful Tibu tribes: Gadawa, Kumosoalla, Hawalla, or Famalla, Medolea, Jinoia or Mallemin, say 10,500, giving a total of 27,900 Tibus in the Chad district.

2. KANEMBU, dwell principally round the eastern, northern, and western shores of the lake, therefore, as already remarked, both in Kanem and Bornu. Their principal tribes are the Sugurti and the Tomaghera or Tomagheri, both in Kanem and Bornu; the Konku, Gallabu, Kuburi, Kunkinna, &c., with a total population of over 18,000.

3. KANURI, the ruling people of Bornu, and by far the most important nation in the Chad basin. Nachtigal proposes two derivations of the name: first from the Arabic

نور = *nūr* = light, and the Kanuri prefix *Ka*, implying the concrete idea of "the people of light," as the first heralds of Islam in the Pagan lands occupied by them. But this mixture of elements from two radically distinct languages, though perhaps interesting to Mr. J. C. Clough and other advocates of mixed languages, can scarcely be meant seriously. It is as if the first English settlers in the Fiji Archipelago were to announce themselves as the "lumen-bearers," as the first messengers of the "lumen evangelii," or "light of the Gospel," to the natives of those islands. Second, and much more probably, a corruption of *Ka-nemri*, implying their Kanem origin, already referred to. Principal Kanuri tribes in Kanem: Bulua, Anjalibu, Rogodobu, Biradull, Biriwa, Melemia, Forebu, Ngama Dukko, the Magomi of Fuli, and Dalatoa. These last, though claiming to be considered a Kanuri people, being really descended from slaves of other races subject to them. Principal tribes in Bornu: The Magomi or Kanuri proper, the Tura, Manga, Nguma, Kai, Ngallaga, Ngalmaduko, Ngomatibu, Ngasir, &c., with a total population of about 1,500,000.

4. MOSGU or MASA family occupies the region south of the Chad as far as Adamawa, and seems to belong to the same race as the extinct So and other autochthonous peoples of Bornu either extirpated by, or absorbed in, the Kanembu invaders of that region. Principal tribes: Margi, Mandara, Mekari or Kotoko, Logon, Gamergu, the unsettled Keribina, and the Mosgu or Masa proper. Masa is the name by which they call themselves. They may number altogether about one million.

5. YEDINA, or BUDUMA and KURI, are the two native laketribe, the former dwelling on the great central group of islands, the latter on the Karka, or smaller South-eastern Archipelago. Yedina is the proper name of the first, Buduma being the name by which they are known to the Kanuri, from *Budu* = hay, and the suffix *ma* singular (for the plural *bu*), meaning the "hay-people." They are fierce and daring pirates; the terror of the surrounding nations. The Kuri, so called by the Arabs and others, call themselves *Kalea* or *Kaleama*, and are undoubtedly akin to the Yedina, though the two languages vary not a little. Principal Yedina tribes: Maijoja, Maibulua, Buja, Guria, Margauna, Jillna; numbering from 15,000 to 20,000 altogether. Principal Kuri tribes: Arigna, Media, Kadiwa, Toshea, Karawa, Kalea.

6. BULALA and KUKA, kindred tribes, originally from Lake Fitri, whither most of them seem to have returned.

Some of the Bulala have withdrawn to a few of the islands in the lake, but the four following tribes are still in Kanem: Ngijem, Bedde, Sarabu, and Tirra, all off the south-east shore of the lake. The Kuka are now found only in Gujer, in the same neighbourhood. They jointly number about 5,800.

7. DANA or DANAWA, called by the Arabs *Haddad*, and by the Dasa or Southern Tibus *Azoa*, both terms meaning "Smiths," occupy a compact territory at the south-east corner of the lake opposite the Korio group of islands inhabited by the Kanembu. According to their tradition, the Danawa are half-caste Manga Tibus and Bulalas, but they now speak a Kanuri dialect.

8. BEDE, about 12° 30' N. lat., 11° E. long.

9. NGISEM, 12° N. lat., 11° E. long.

10. KERRIKERRI, 11° 30' N. lat., 11° E. long.

11. BABIR, 11° N. lat., 12° E. long.

12. BAGIRMI, along the eastern or right bank of the Lower Shari, with undefined southern limits, and extending north-eastwards in the direction of Lake Fitri and Waday. Are closely related to the Sara tribes of the Middle Shari, and are also connected with the Jur and Dor dwelling on some of the head waters of the White Nile. Some of the Bagirmi are settled in Bornu, where they are called Karde, possibly through some confusion with their northern neighbours, the Kredas of the Bahr-el-Ghazal, who are Dasa or Southern Tibus akin to the Sakerda further up the bed of that now dried-up stream.

13. HAUSSA communities exist in one place only in Bornu, the district round about Gummel, on the 13° parallel and the 10° E. long. north-east of Kano.

14. ARAB TRIBES are found both in Kanem and Bornu. The principal Kanem tribes are the Tunjer, Uiedsoliman (Wassili), and Mgharba, about 80,000 altogether. The principal Bornu tribes are the Auladamed and Salamat, numbering perhaps 100,000. Many of them have become in some respects assimilated to the surrounding Kanuri people, but still hold tenaciously to their Semite speech. "I have met with Arabs settled in Bornu for a series of generations, near the centre of the kingdom, and who were still so little acquainted with the Kanuri language that I was obliged to act as their interpreter" (Nachtigal). These Bornu Arabs are called Shoa by the Kanuri, and are carefully to be distinguished from those Arabs who occasionally make their appearance in these regions, either as marauders or traders from the Barbary States.

Though mainly ethnological, Dr. Nachtigal's paper is introduced with a few geographical notes, which, however, present little or no novelty. The lake is described as about 27,000 square kilometres in superficial area, of a triangular shape, open and navigable in its western section, but along its eastern shores crowded by a large number of islands in many places separated only by narrow channels one from the other. The upper course of its one great affluent, the Shari, still remains to be determined, the writer merely remarking on that point that it flows "in two main streams apparently rising in the heathen lands to the south and south-east of Waday, receives a small portion of the rivers flowing down the western slopes of the Marra range, and throughout the whole year discharges a considerable volume of water into the lake." The Bahr-el-Ghazal, its former north-easterly outflow, has long been dried up, so that the Chad has now no outlet of any sort, its waters being kept by evaporation alone at their present variable levels.

But nothing could possibly be more thorough and satisfactory than Nachtigal's elucidation of the complicate ethnography of this region, which he has disentangled as successfully as Stanley has just solved the geographical problems connected with Lake Tanganyika.

A. H. KEANE